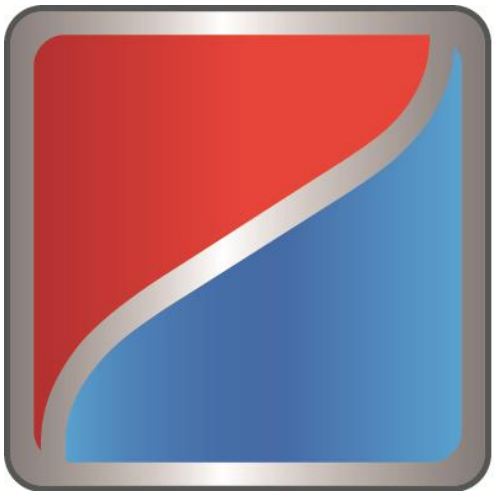
User Manual

AirecCalc©

AIREC Calculation Software Plate Heat Exchangers



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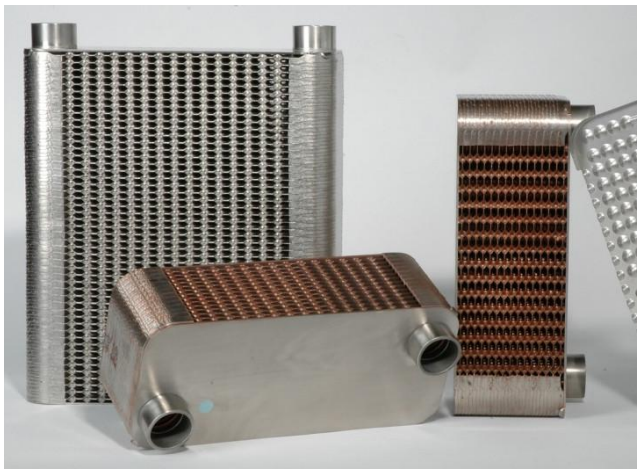
1. Introduction

AirecCalc is a user-friendly interface developed to calculate performances for AIREC Heat Exchanger, Cross30. Other heat exchangers will be added later on.



Cross30

Main features of the software are:

Mode	Desription
DESIGN	Program will choose the design on heat exchanger based on user input
RATE	Choose your own heat exchanger design and evaluate performance
Possibility to calculate condensation from a mixture of "condensable and non-condensable gases" (for example humid air or exhaust gas).	

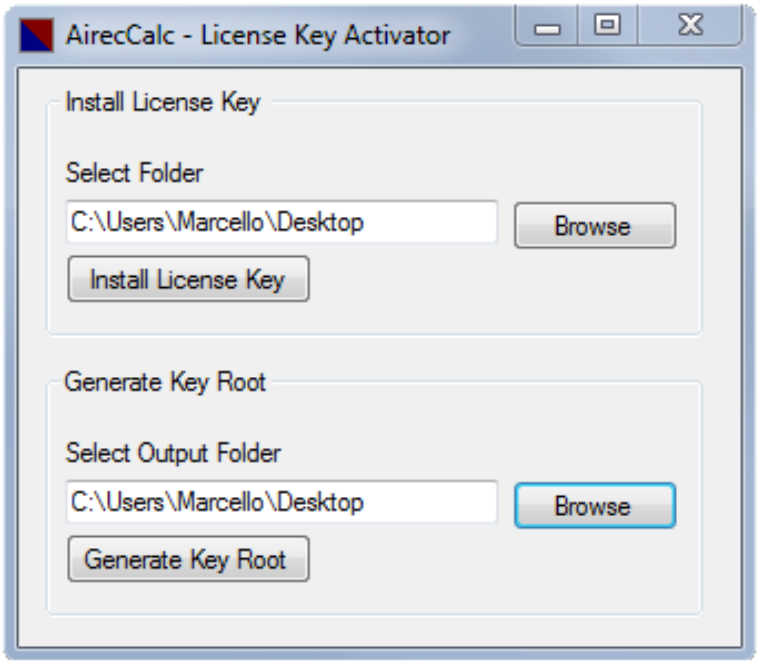
2. System requirements

Recommended minimum system requirements are:		
Windows XP or later	1 GB RAM	20 GB hard drive
.NET Framework 4 (Will be installed during installation if not present).		
Please note! AirecCalc is based on the Microsoft .NET technology, and it run exclusively on Microsoft based platforms.		

3. Installation procedure (License)

You will always need a new license in following cases to be able to run AirecCalc:
- You are new user and install AirecCalc for the first time - Want to install AirecCalc on the new computer ***Please Note!***
- License is unique for each computer *- License is valid for 12 months* *- Contact AIREC at info@airec.com for renewal of license*

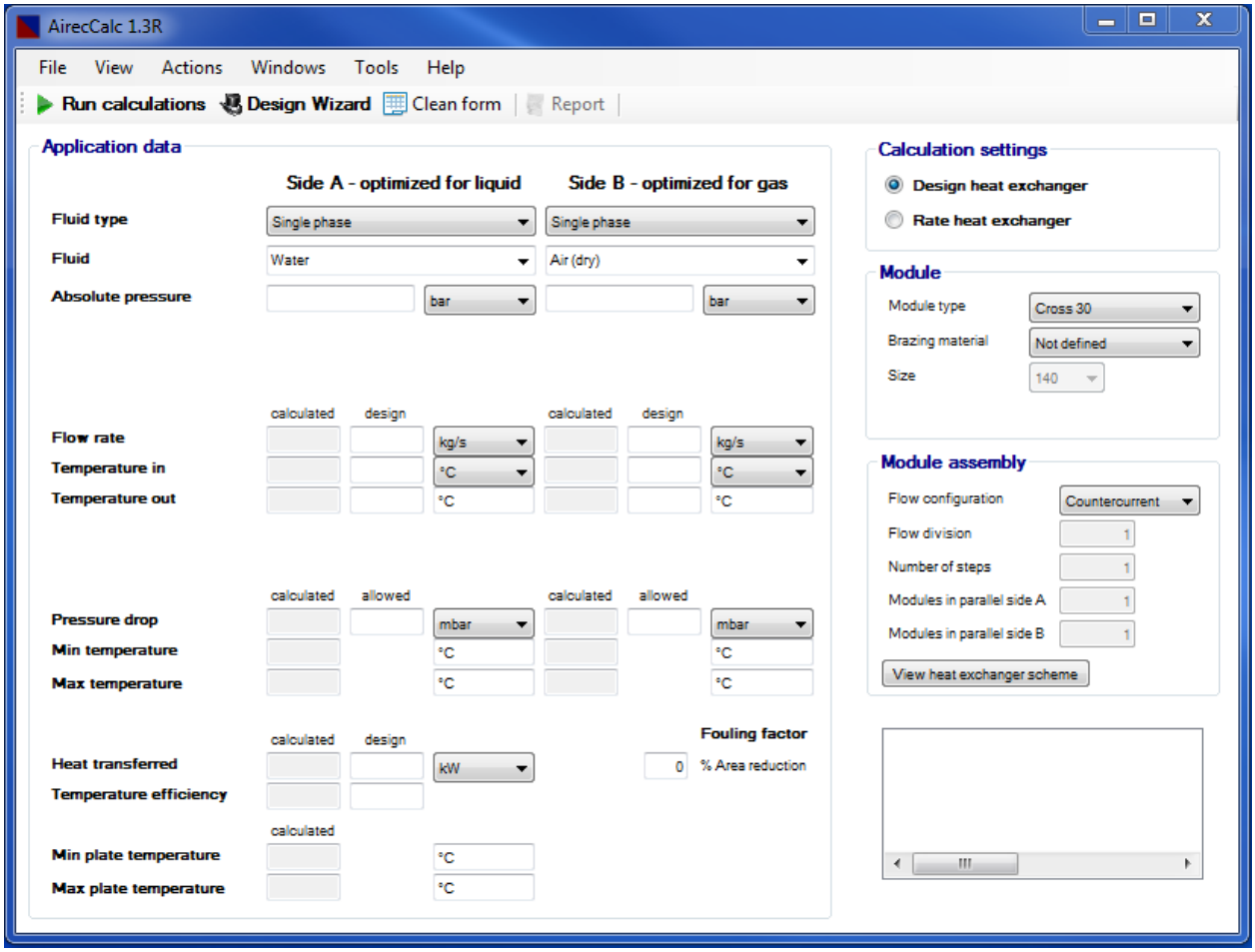
How to install the program and gets the license (F.O.C.) for the first time or for reinstallation.		
1	Double click the on the installation **"setup.exe"** file	
2	Follow the setup instructions on the screen.	
3	Installation is done. Find the AirecCalc icon on your desktop, double click on the icon.	
4	Following screen will appear: **"AirecCalc – License Key Activator"** (see image below).	
5	**[Generate key root]:** Click on this button and you will generate the key root file **"keyroot.krf"** *	
6	* Send this file **"keyroot.krf"** with your name, company, address, and e-mail to: info@airec.com	
7	When you receive the license key file **"Licensekey.lck"**. Save it to your computer.	
8	**[Install license key]:** Click on this button to install the **"Licensekey.lck"** (see image below)	
If you have problem during installation do not hesitate to contact us at: info@airec.com		



4. Running AirecCalc

Main window *(windows based user interface)*

Startup window	
Windows List/Bar	Shows version of “AirecCalc 1.2R” (1.2 = version, R = Redistributable)
Menu bar	File, View, Actions, Windows, Tools, Help
Command bar	Run calculations, Design Wizard, Clean form, Report
Application data	Mainly two columns, side A (Water/Liquid), side B (Gas/Steam) for data input.
Calculation settings	"Design" (program choose) or "Rate" (you choose) heat exchanger design.
Module	Choose HEX-type, brazing material and number of plates
Module assembly	Choose flow configuration, FD, NS, PA, PB…
Information box	Shows Information/Warnings during calculation



5. Menu bar

Menu	Description	Short explanation
File	New	Clears all fields and opens up for a new calculation ("Command Bar" includes even this command as “Clean form”)
	Open	Open a saved calculation file (*.arc)
	Save	Save a calculation to file (*.arc)
	Exit	Exit the AirecCalc software

View	Toolbar	Show or Hide the Command Bar
Actions	Run calculations	Run calculations must always be pressed when you have entered/changed any values for your configuration ("Command Bar" includes even this command)
Windows	Media database	Includes information about the different medias in the database
	Project	Open/Save a calculation/project. Print/Export report to different format such as (txt, xls, pdf, doc) ("Command Bar" includes even this command as “Report”)
	Pipe design	Get Diameter/Velocity for the pipes in/out, for Side A and B: - Set diameter and get velocity - Set velocity and get diameter
Tools	Default units	SI (Pascal), US (psi), Default (bar)
	Settings	User settings: User name, Language, Company
		Calculations: “Lower cost, “Best match” and so on…
		Paths: Quotation folder, Media database
Help	About AirecCalc	Shows AirecCalc version, AIREC AB address…

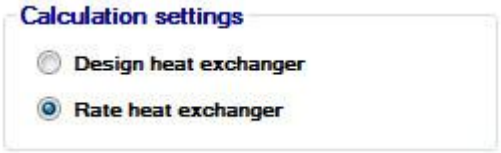
6. Command bar

Menu	Description
Run calculations	Run calculations must always be pressed when you have entered/changed any values for your configuration ("Menu Bar → Actions → Run calculation" is the same command)
“Stop calculations”	*“Only active during calculations”*
Design wizard	In 4 easy steps will this wizard help you through the data input to be able to design the heat exchanger
Clean form	Clears all fields and opens up for a new calculation ("Menu Bar → File → New" is the same command)
Report	OBS! Report, only activated after a calculation has been performed Open/Save a calculation/project. Print/Export report to different format such as (txt, xls, pdf, doc) ("Menu Bar → Windows → Project" is the same command)

7. Calculation fields *(Calculation settings, Module, Module assembly, Info box, and Application data)*

7.01 Calculation settings

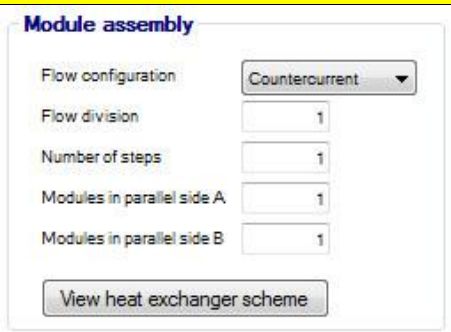
Mode	Description
Design heat exchanger	AirecCalc will choose the design of heat exchanger
	When pressing the button [Run calculations]. The program will automatically try to find optimal solution of heat exchanger.
	ATTENTION! This function must always be used together with the Rate function, to find the best solution on the HEX.

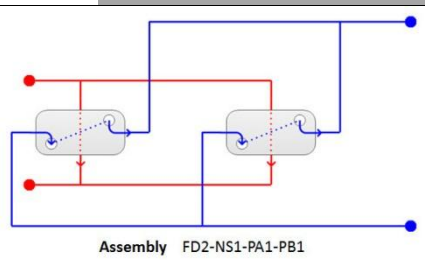
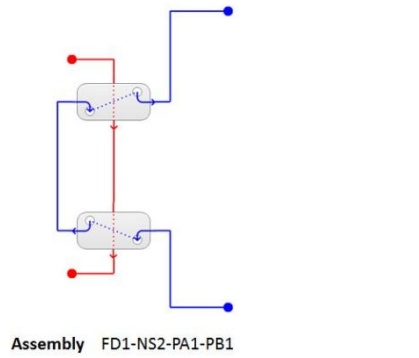
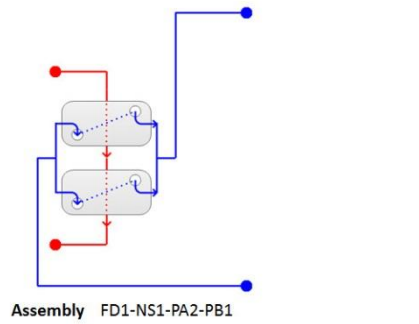
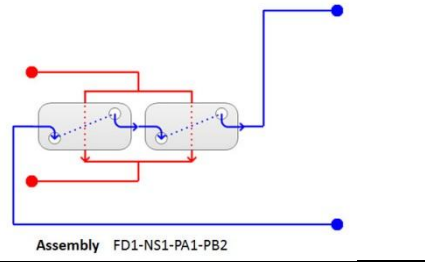
Rate heat exchanger	Choose your own design of the heat exchanger
	The user is allowed to set flow, temperature, pressure drop, number of plates and arrange the heat exchanger configuration.
	

7.02 Module

Mode	Description
Module	
Module type	Set type of HEX
Brazing material	Set brazing material. Copper (Cu), Nickel (Ni) or Not defined.
Size	Set the number of plates. ***Please note!*** Number of plates available is depending on brazing material.

7.03 Module assembly *(FD?-NS?-PA?-PB?)*

Mode	Description
Module assembly	
Flow configuration	Set type Countercurrent or Concurrent
	Concurrent = fluids flow in the same direction through the heat exchanger.
	Countercurrent = that the fluids will move in the opposite direction through the heat exchanger.

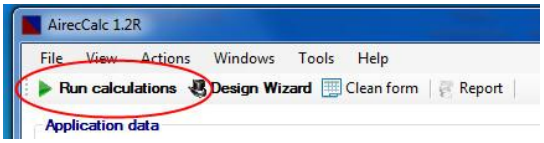
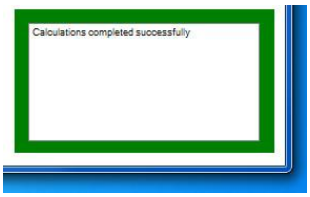
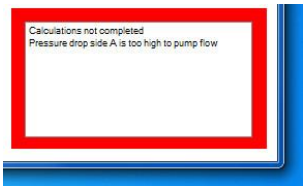
FD: Flow division	*Example:* *2 x Cross30* *Setup: **FD2**-NS1-PA1-PB1* *Side A (blue): Parallel* *Side B (red): Parallel*	
	FD: Flow (side A/B) is both split up in parallel flows through multiple heat exchanger modules.	
NS: Number of steps	*Example:* 2 x Cross30 Setup: FD1-**NS2**-PA1-PB1 Side A (blue): Serial Side B (red): Serial	
	NS: Flow (side A/B) will pass multiple heat exchangers in series.	
PA: Modules in parallel side A (Liquid/Water)	*Example:* 2 x Cross30 Setup: FD1-NS1-**PA2**-PB1 Side A (blue): Parallel Side B (red): Serial *Note!* *This set up can cause high maximum surface/liquid temperature, and cause boiling/thermal stress on the heat exchangers.*	
	PA: Blue flow (side A) will pass multiple heat exchangers in parallel. The red flow (side B) will alternately pass the heat exchanger modules in series.	
PB: Modules in parallel side B (Gas/Steam)	*Example:* 2 x Cross30 Setup: FD1-NS1-PA1-**PB2** Side A (blue): Serial Side B (red): Parallel	
	PB: Red flow (side B) will pass multiple heat exchangers in parallel. The blue flow (side A) will alternately pass the heat exchanger modules in series.	
View heat exchanger scheme	After **[Run calculations]** you will see a sketch / system image similar to the above with the flow configuration.	

7.04 Number of heat exchanger

-	Description
Number of Heat exchangers	The number of heat exchangers in an assembly is calculated from the configuration (FD?-NS?-PA?-PB?)

	FD**?** – NS**?** – PA**?** – PB**?**
	FD**?** x NS**?** x PA**?** x PB**? = ? Heat exchangers**
	Ex.: FD2 – NS2 – PA1 – PB3
	Ex.: 2 x 2 x 1 x 3 **= 12 heat exchanger modules**

7.05 Information box *(Found in main screen in the lower left corner)*

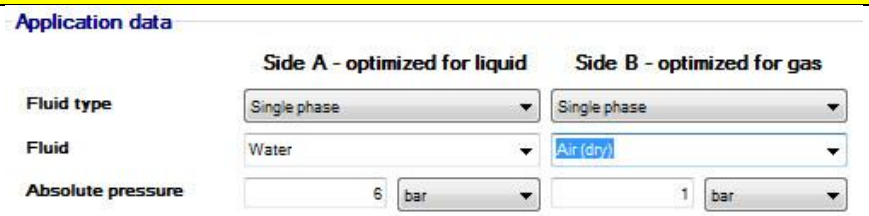
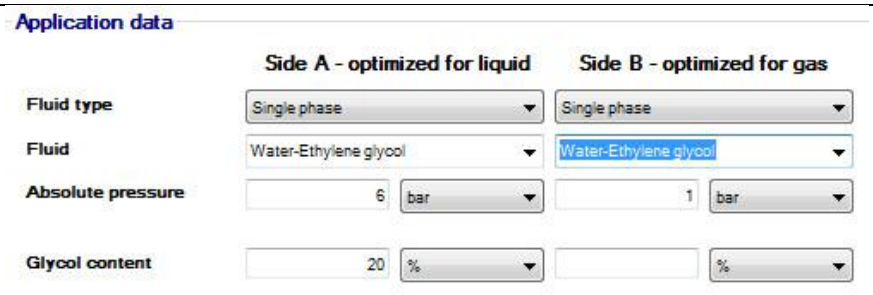
Mode	Description	
Information box (No frame)	Default (no frame) when starting the AirecCalc or the you choose **"New"** or **"Clean form"** for a new calculation	
Frames around the Information box	Note! Activated first when you use the function **"Run calculation"** to calculate performance for heat exchangers  AirecCalc 1.2R File View Actions Windows Tools Help Run calculations Design Wizard Clean form Report Application data	
Information box (Green frame)	This means that the program found solution with no warnings and you can now try/play with different values to find a good/best solution for the Heat Exchangers.	
Information box* (Yellow frame)	This is mostly information but can also be a hint that input data should be changed to find a better solution for the Heat Exchangers	
Information box* (Red frame)	Critical warning. In this state you can not continue the calculation without changing input data until the frame turn green or yellow. **Important!** Each time you change any value you must press **"Run calculation"**	

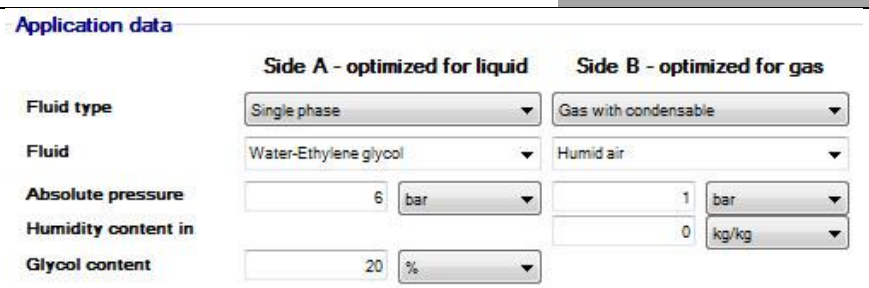
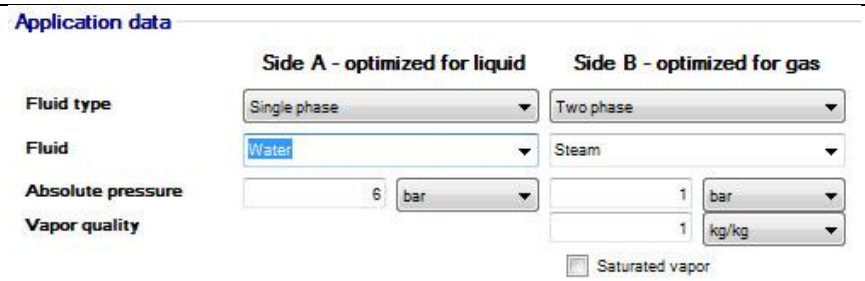
7.06 * Warnings/Information!

Warnings/Information	Explanations
Calculated media temp side A above design value	Calculated temperature is above or below the given design value
Calculated media temp side A below design value	Calculated temperature is above or below the given design value
Calculated media temp side B above design value	Calculated temperature is above or below the given design value
Calculated media temp side B below design value	Calculated temperature is above or below the given design value
Calculated plate temp above design value	Calculated temperature is above or below the given design value
Calculated plate temp below design value	Calculated temperature is above or below the given design value
CAUTION: BOILING RISK (WATER)!	Warning!!! Which must be considered, change input data to find a better solution

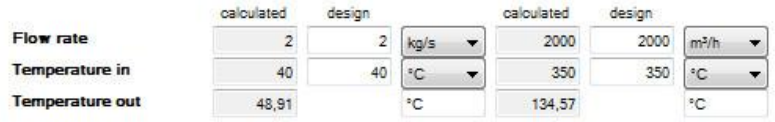
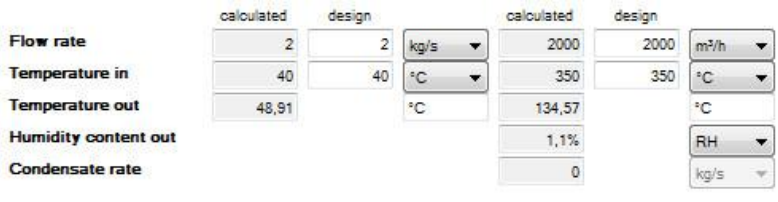
Critical Warning: **Pressure drop side A is too high to pump flow"**	"Pressure drop side A is too high to pump flow"
Critical Warning: **Pressure drop side B is too high to pump flow**	"Pressure drop side B is too high to pump flow"
Extrapolated single phase properties side B	Temperature is outside the range
Extrapolated single properties side A	Temperature is outside the range
Extrapolated two phase properties	Temperature is outside the range
High flow velocity side A	Too high/low flow and the calculations of heat transfer are not reliable
High flow velocity side B	Too high/low flow and the calculations of heat transfer are not reliable
Low flow velocity side A	Too high/low flow and the calculations of heat transfer are not reliable
Low flow velocity side B	Too high/low flow calculations of heat transfer are not reliable
No condensation occurs	Only! Information to the user
Partial condensation	Only! Information to the user
Total condensation	Only! Information to the user
Volume flow side A bigger than volume flow side	Recommendation that the liquids should maybe change sides

7.07 Application data *(Fluid)*

Mode	Description
Two columns: - Side A (Liquid/Water) → - Side B (Gas/Steam) →	
	Side A – High density flow (color in sketches/Scheme: **Blue**).
	Side B – Low density flow (color in sketches/Scheme: **Red**).
Fluid type	**Side A** – *Single phase* **Side B** – *Single phase, Gas with condensable and Two phase*
Fluid	A selection of Fluids/Gases can be chosen from the drop lists ***Please note!*** New Fluids/Gases can only be added by AIREC. Please contact us by e-mail: info@airec.com
Absolute pressure	Working pressure for media in: *(bar, Pa, kPa, mbar, PSI, mm H_2O, mm Hg, inch H_2O)*
Glycol content	
	Side A – Content of Glycol in: *(%)* **Side B** – Content of Glycol in: *(%)*

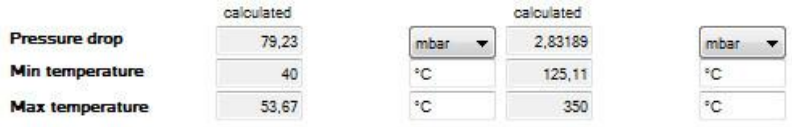
Humidity content in	
	Side B – Humidity content in: (*kg/kg, g/kg, RH)*
	
Vapor quality	Steam quality in: (*kg/kg, g/kg, % RH)*
Saturated vapor	Saturated Vapor/Steam: "*Yes or No*"

7.08 Application data *(Flow, Temp…)*

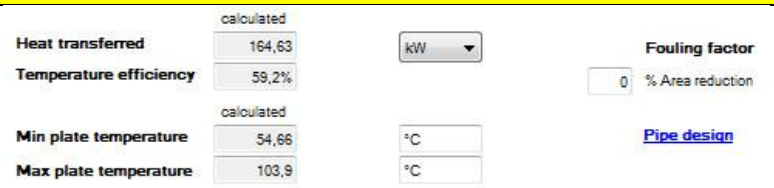
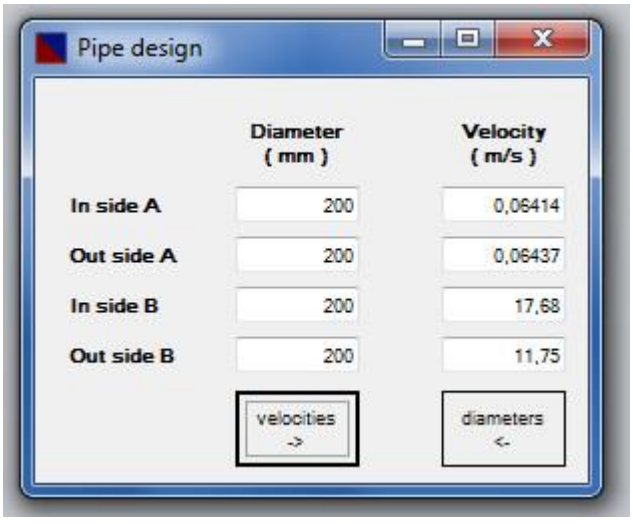
Mode	Description
Two columns: - Side A (Liquid/Water) → - Side B (Gas/Steam) →	
Flow rate	Set the flow Liquid/Gas side in: *(kg/s, kg/h, m^3/h, N m^3/h, l/min, ft/min, lb/min)*
Temperature in	Set the inlet temperature for Liquid/Gas side in: *[°C (Celsius), K (Kelvin), F (Fahrenheit)]*
Temperature out	Set the outlet temperature for Liquid/Gas side in: *[°C (Celsius), K (Kelvin), F (Fahrenheit)]*
	
Humidity content out	Shows outlet humidity content in: *(kg/kg, g/kg, % RH)*
Condensate rate	Shows condensate rate/speed in: (kg/s, kg/h)

7.09 Application data *(Pressure drop, Min/Max Temp…)*

Mode	Description

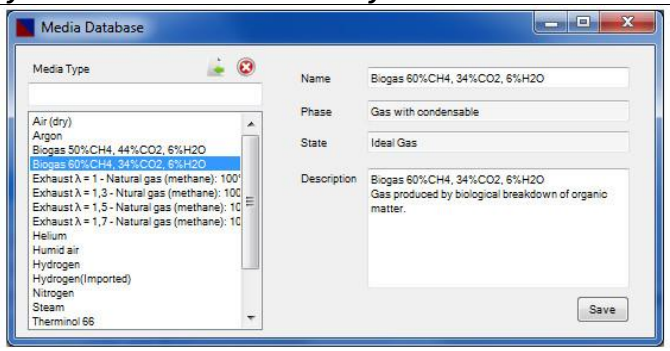
Two columns: - Side A (Liquid/Water) → - Side B (Gas/Steam) →	
Pressure drop	Shows pressure drop for Liquid/Gas on the outlet side in: *(Pa, kPa, mbar, bar, psi, mm H_2O, mm Hg, inch H_2O)*
Min temperature	Shows the lowest temperature for Liquid/Gas in: *[°C (Celsius), K (Kelvin), F (Fahrenheit)]*
Max temperature	Shows the highest temperature for Liquid/Gas in: *[°C (Celsius), K (Kelvin), F (Fahrenheit)]*

7.10 Application data *(Heat transferred, Temperature efficiency)*

Mode	Description
Two columns: - Side A (Liquid/Water) → - Side B (Gas/Steam) →	
Heat transferred	Displays the heat which is transferred with this calculation in: *(W, kW, kcal/h, BTU/h)*
Temperature efficiency	Displays the temperature efficiency of this calculation:: *(%)*
Min plate temperature	*Displays minimum plate-temperature with this calculation:* *[°C (Celsius), K (Kelvin), F (Fahrenheit)]*
Max plate temperature	*Displays maximum plate-temperature with this calculation:* *[°C (Celsius), K (Kelvin), F (Fahrenheit)]*
Fouling factor	Here you can set a percent factor for fouling, if you expects to get dust or particles on the plates on the gas side in: *(%)*
Pipe design	
	Get the Diameter/Velocity for the pipes in/out, for Side A/B for this calculation: - Set diameter *(mm)* and get velocity *(m/s)* - Set velocity *(m/s)* and get diameter *(mm)*

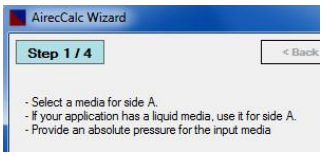
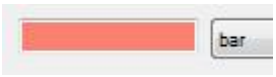
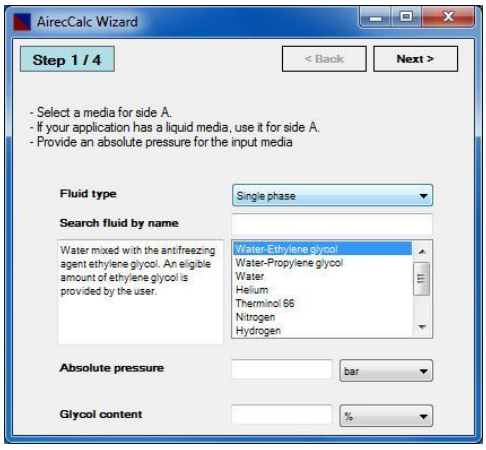
8. Media database

At the main screen under "Windows → Media database" you find the media library

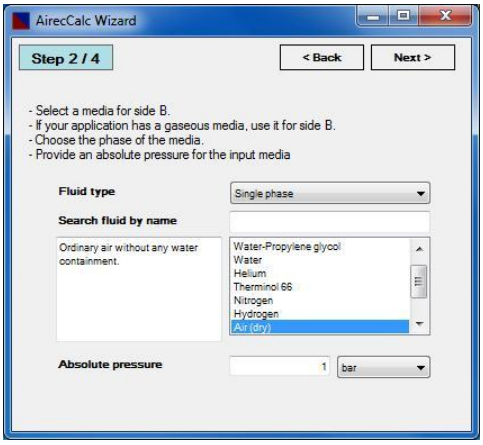
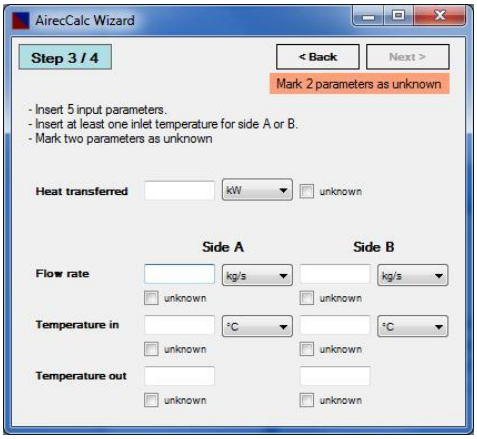
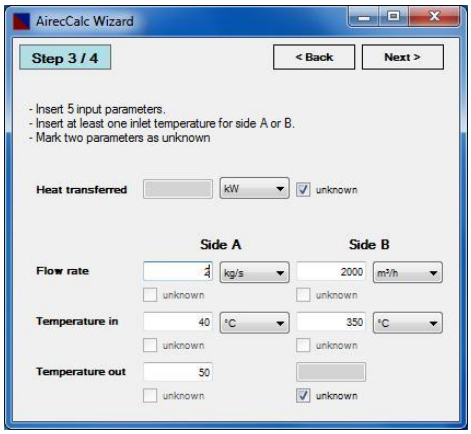
Mode	Description
ATTENTION! ***From this version of AirecCalc you are not allowed to enter your own media/variables.***	
Media type	
	Media type field: Only used by AIREC
	Scroll bar: here you can scroll and see which media are installed. If the media you request/need is not in the list, see below "Import media"
 (Import media)	Import Media *Please note!* New fluids/gases may be added only by AIREC. Send an e-mail with subject "media request", your name, company, address, and e-mail to: info@airec.com 1) When your receive an media file ex. *"*.mfe"* from AIREC. 2) Save it on your computer 3) Click on the icon "Import media", look for the folder where you save the media file. 4) Open the file and install.
 (Delete media)	Deletes selected media from the scroll list
Name	Name of the media and the name which will be shown in the Media Type list
Phase	Ex. Single phase, Gas with condensable and Two phase
State	Ex. Ideal Gas, Incompressible fluid
Description	Field for a more detailed description/nature of the liquid/gas

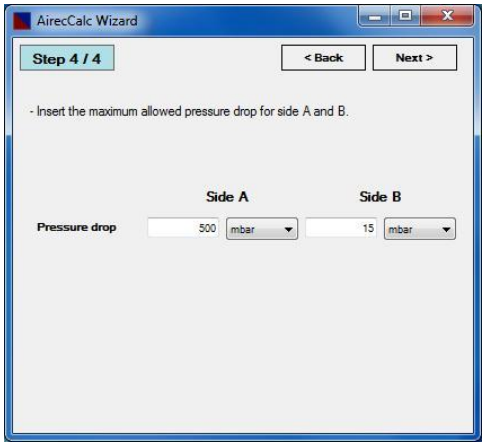
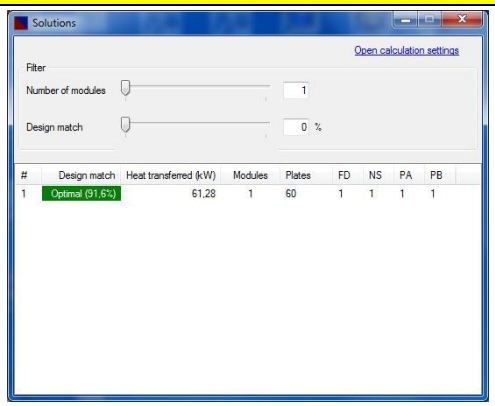
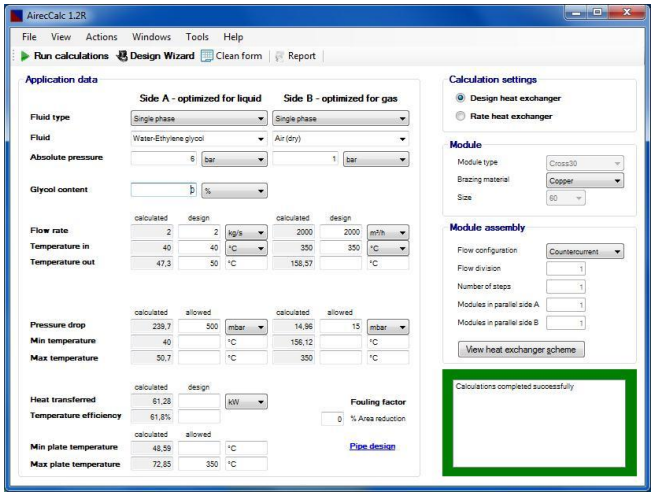
9. Design Wizard

At the main screen under "Command bar → Design Wizard"

<table>
<tr><th>Mode</th><th>Description</th></tr>
<tr><td rowspan="4">Design Wizard</td><td colspan="2">In 4 easy steps will this wizard help you through the data input to be able to design the heat exchanger/exchangers.</td></tr>
<tr><td>Each step has a short explanation just under the box ex. [Step 1 / 4]</td><td> 
</td></tr>
<tr><td>If you forget to fill in data in a field it will change colour to red.</td><td> 
</td></tr>
<tr><td colspan="2">Required fields must be filled in before you can proceed to the next step.</td></tr>
<tr><td rowspan="4">Step 1 of 4</td><td colspan="2"> 

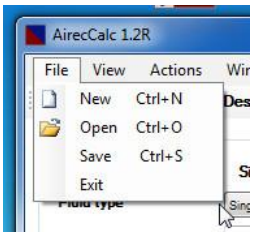
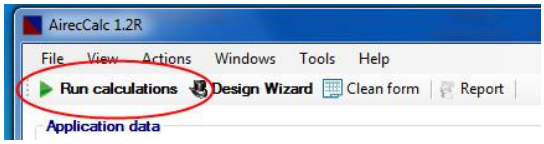
</td></tr>
<tr><td colspan="2">Select: Fluid type for Side A (Liquid/Water)</td></tr>
<tr><td colspan="2">Abolut pressure in: (bar, Pa, kPa, mbar, PSI, mm H_2O, mm Hg, inch H_2O)</td></tr>
<tr><td colspan="2">This field is active only for certain media!
Glycol content, if this field appear give content in: (%)</td></tr>
</table>

<table>
<tr><td rowspan="4">Step 2 of 4</td><td> 
</td></tr>
<tr><td>Select: Fluid type for Side B (Gas/Steam)</td></tr>
<tr><td>Abolut pressure in: (bar, Pa, kPa, mbar, PSI, mm H_2O, mm Hg, inch H_2O)</td></tr>
<tr><td>This field is active only for certain media!
Glycol content, if this field appear give content in: (%)</td></tr>
<tr><td rowspan="5">Step 3 of 4</td><td colspan="2">This field is active only for certain media!
Condensable content in, if this field appear give content in: (kg/kg, g/kg, % RH)</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td colspan="2">[Unknown], 7 pcs. checkboxes:
- Two fields must be left empty to make a calculation.
- Mark two checkboxes for which you do not have any data for.</td></tr>
<tr><td colspan="2">Heat transferred in: (W, kW, kcal/h, BTU/h)</td></tr>
<tr><td colspan="2">Flow rate in: (kg/s, kg/h, m^3/h, N m^3/h, l/min, ft/min, lb/min)</td></tr>
<tr><td colspan="2">Temperature in: [°C (Celsius), K (Kelvin), F (Fahrenheit)]</td></tr>
<tr><td colspan="2">Temperature out: [°C (Celsius), K (Kelvin), F (Fahrenheit)]</td></tr>
</table>

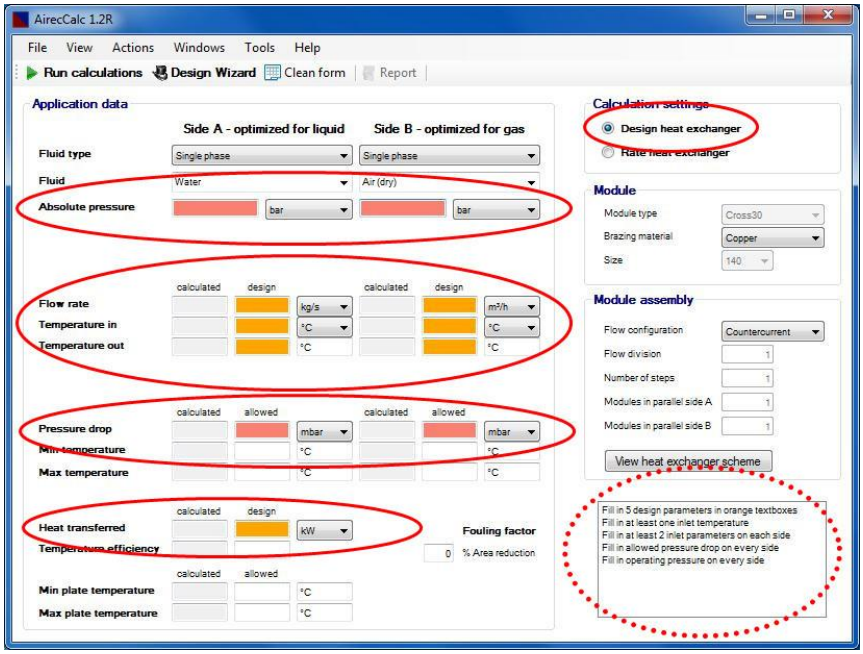
Step 4 of 4	
	Pressure drop in: *(Pa, kPa, mbar, bar, psi, mm H_2O, mm Hg, inch H_2O)*
The Design Wizard is completed and will now show the result of your input data	
“Calculation result”	
	- If the program can make an accurate calculation using the read data when a window similar to the one above will appear
	- If the calculation is not performed correctly, the information box will change color and display a warning/message
	- If the results you got is okay, you can start to optimize your heat exchanger. By playing with the numbers and layout.
	- Use “**Design Heat Exchanger**” or “**Rate heat exchanger**”. **ATTENTION!** To find the best solution use the Rate heat exchanger.
	

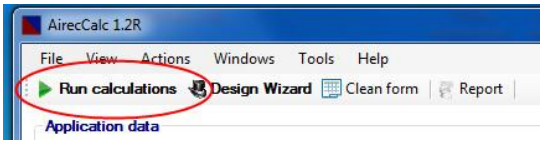
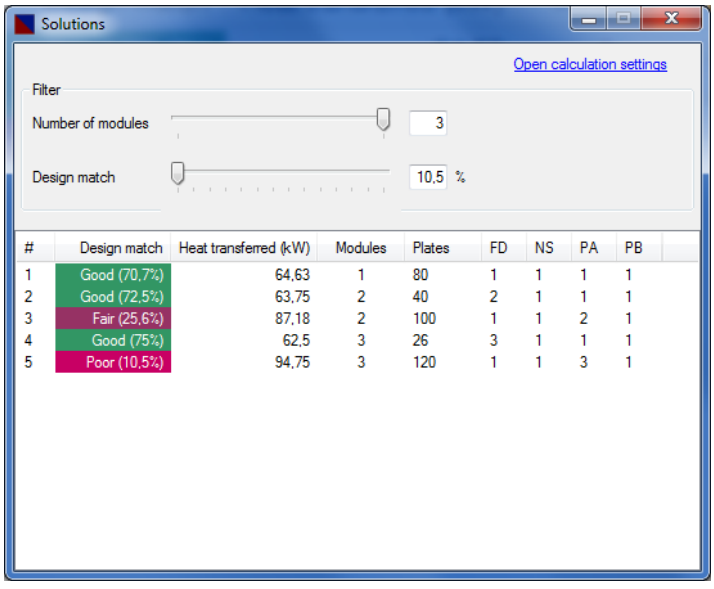
10. Open and save Calculation/"Quotation"

Windows standard procedure to save or open files

Menu	Description	Short explanation
File	New	Clears all fields and opens up for a new calculation ("Command Bar" includes even this command as "Clean form")
	Open	Open an saved calculation file (*.arc)
	Save	Save an calculation to file (*.arc)
	Exit	Exits the AirecCalc software
	Open and save: (files: *.arc)	
Open	When opening a saved calculation file (*.arc). You must always press "**Run calculation**" to get all figures back into the AirecCalc software.	
	Run calculation	

11. Running calculation *(Design heat exchanger)*

Mode	Description
Design heat exchanger	
	Fields to be filled in to complete a calculation. - ***Important!*** The information box will give you information/help during the input of data

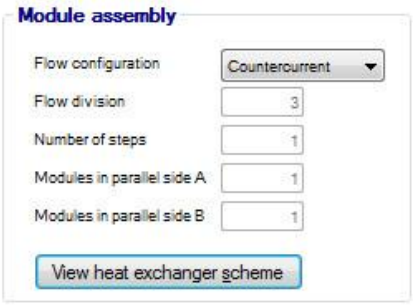
	Orange boxes	
	You must fill in 5 design parameters in the orange boxes	
	Flow rate: Set the flow Liquid/Gas side in *(kg/s, kg/h, m^3/h, N m^3/h, l/min, ft/min, lb/min)*	
	Temperature in: Set the inlet temperature for Liquid/Gas side in *(°C, K , F)*	
	Temperature out: Set the outlet temperature for Liquid/Gas side in: *(°C, K , F)*	
	Heat transferred: Set the desired heat transfer in *(W, kW, kcal/h, BTU/h)*	
	Red boxes	
	Absolute pressure: Set working pressure for media in *(bar, Pa, kPa, mbar, PSI, mm H_2O, mm Hg, inch H_2O)*	
	Pressure drop: Set max allowed pressure drop for Liquid/Gas on the outlet side in *(Pa, kPa, mbar, bar, psi, mm H_2O, mm Hg, inch H_2O)*	
Run calculation		
Solutions windows	- If your input data is correct and you have pressed the “Run calculation” button. - You will see logo for AIREC and below a time line running during the calculation	
	"Solutions window" will pop up when the calculation is done. See picture below.	
		
	Open calculation settings	*See chapter 5. Menu bar → Tools → Settings →*
Filter	Number of modules	You can select number of modules in configuration to be shown
	Design match	If you set ex. 70%, all "Design match" over 70% percent will be

		shown
Tables	#	Shows number of positions
	Design match	Shows Excellent/Good/Fair/Poor match with a percentage
	Heat transferres (kW)	Shows amount of heat transferred in (kW)
	Modules	Shows number of Heat exchangers in the design
	Plates	Shows number of plates in each Heat exchanger
	FD?-NS?-PA?-PB?	*For explanation about the different possibilities for configuration of heat exchangers,* *See chapter 7. Calculation fields → Module assembly →*

View heat exchanger scheme

Solutions
Open calculation settings
Filter
Number of modules
3
Design match
10 %
Design match Heat transferred (kW) Modules Plates FD NS PA PB
1 Good (70,7%) 64,63 1 80 1 1 1 1
2 Good (72,5%) 63,75 2 40 2 1 1 1
3 Fair (25,6%) 87,18 2 100 1 1 2 1
4 Good (75%) 62,5 3 26 3 1 1 1
5 Poor (10,5%) 94,75 3 120 1 1 3 1

Picture. 1



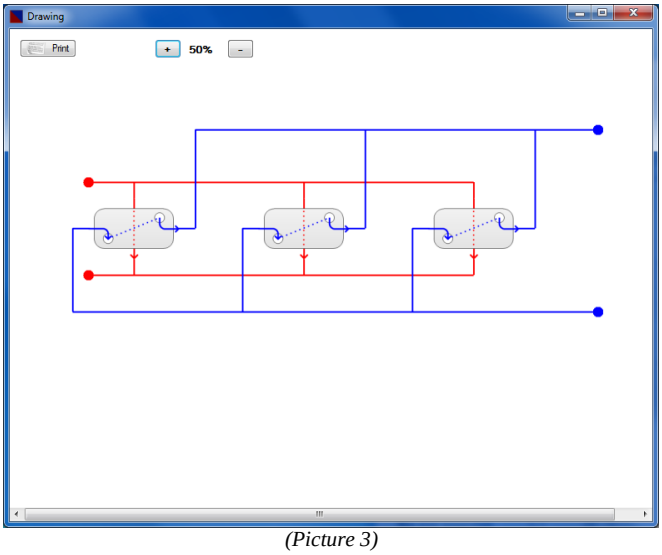
Picture. 2

Click on a row, in this example we choose row # 4 *(Picture 1)*

You can see that the figures in the Module box in the main windows will change to: FD3-NS1-PA1-PB1 *(Picture 2)*

Click on the button “View heat exchanger scheme” *(Picture 2)*

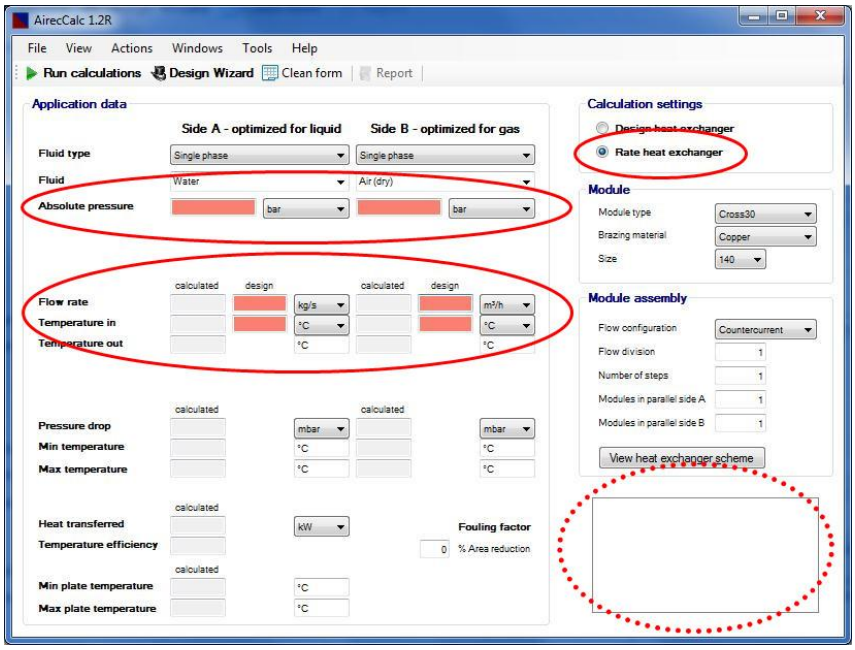
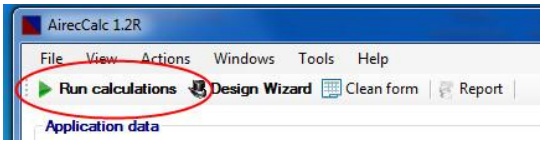
“Drawing windows” will pop up and you can see the heat exchangers configuration. In this example FD3-NS1-PA1-PB1*(Picture 3, below)*



(Picture 3)

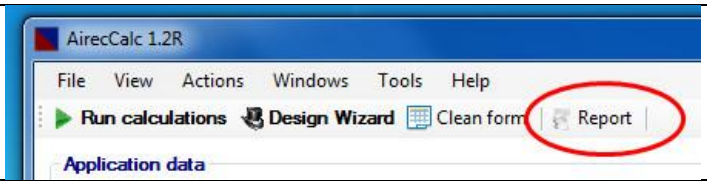
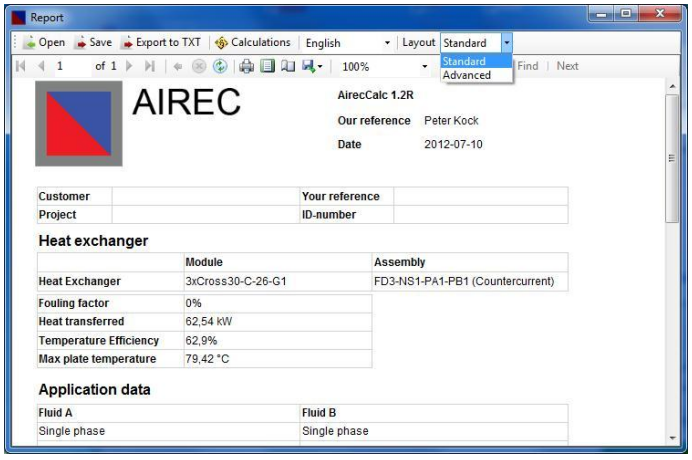
12. Running calculation *(Rate heat exchanger)*

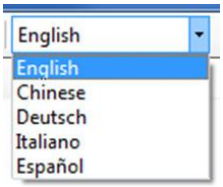
Mode	Description

<table>
<tr><td rowspan="2">Rate heat exchanger</td><td> 
</td></tr>
<tr><td>Fields to be filled in to complete a calculation.
- Important! The information box will give you information/help during the input of data</td></tr>
<tr><td rowspan="3">Module</td><td>Module type: Set type of HEX</td></tr>
<tr><td>Brazing material: Set brazing material. Copper (Cu), Nickel (Ni) or Not defined.</td></tr>
<tr><td>Size: Set the number of plates.
Please note! Number of plates available depending on brazing material.</td></tr>
<tr><td rowspan="6">Module assembly</td><td>Flow configuration: Concurrent or Countercurrent</td></tr>
<tr><td>Flow division (FD)</td><td rowspan="4">For explanation about the different possibilities for configuration of heat exchangers, see chapter 7 Calculation fields → Module assembly →</td></tr>
<tr><td>Number of steps (NS)</td></tr>
<tr><td>Modules in parallel side A (PA)</td></tr>
<tr><td>Modules in parallel side B (PB)</td></tr>
<tr><td>View heat exchanger scheme: After [Run calculations] you will see a sketch/system image with the flow configuration.</td></tr>
<tr><td rowspan="5"></td><td>Red boxes</td></tr>
<tr><td>You must fill in 5 design parameters in the red boxes</td></tr>
<tr><td>Absolute pressure: Set working pressure for media in
(bar, Pa, kPa, mbar, PSI, mm H_2O, mm Hg, inch H_2O)</td></tr>
<tr><td>Flow rate:
Set the flow Liquid/Gas side in (kg/s, kg/h, m^3/h, N m^3/h, l/min, ft/min, lb/min)</td></tr>
<tr><td>Temperature in:
Set the inlet temperature for Liquid/Gas side in (°C, K , F)</td></tr>
<tr><td>Run calculation</td><td> 
</td></tr>
</table>

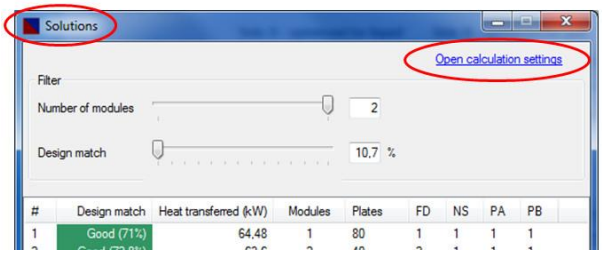
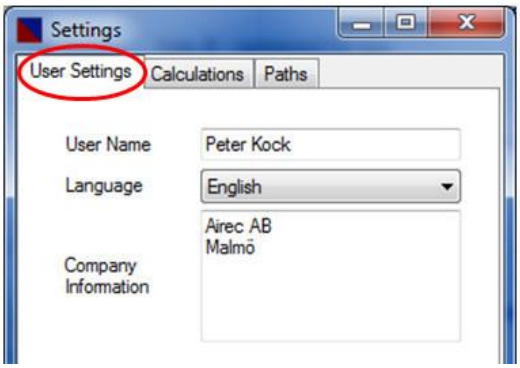
13. Report/"Quotation"

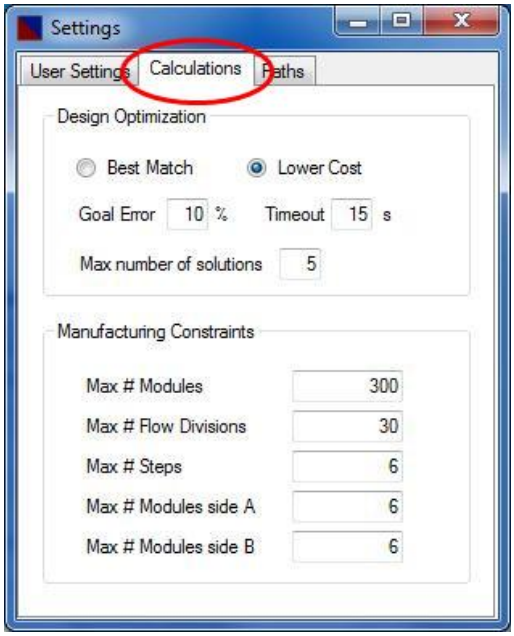
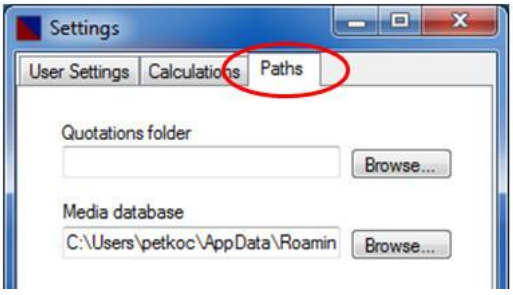
Windows standard procedure to save or open files

<table>
<tr><th>Mode</th><th colspan="2">Description</th></tr>
<tr><td rowspan="5">Report</td><td colspan="2">When you found a good configuration for the heat exchanger you can create an report/quotation</td></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td colspan="2">Click on the button “Report”</td></tr>
<tr><td colspan="2">"Report Window" similar to the one below will pop up</td></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td>Report</td><td>Open:</td><td>Open an saved calculation file (*.arc)</td></tr>
</table>

Menu bar	Save:	Save an calculation to file (*.arc)
	Export to TXT:	Save the first page application data to an TXT-file
	Calculations:	When opening a saved calculation file (*.arc). You must always press "**Run calculation**" to get all figures back into the AirecCalc software.
	Language *(available):*	
	Layout *(Print Report)*	Standard: Print an basic report (1 pages) Advanced: Print an advanced report (3 pages)
Report Command bar		Browse through the pages
		Back to the parent report , Stop rendering , Refresh
		Print
		Print layout
		Page setup
		Export to file-format: DOC, PDF, XLS By this you can edit the file add/remove information And createdesign your own Report/Quotation
		Search in the report

14. Settings

Mode	Description
Settings	Can be found under: **"Menu bar → Tools → Settings"** or in the upper corner on the right hand side when using **"Design heat exchanger → Solutions window"**
	
User Settings	
	***OBS!** User Settings will be printed/displayed on Reports*

	User name	Write your name
	Language	Set language for the report.
	Company information	Write company information
Calculations		
Design Optimization	**OBS!** Those setting only active when your In **"Desing heat exchanger"**	
	Best Match	Optimize the search to return the best possible match with input values
	Lower Cost	Optimize the search to return the smallest heat exchanger
	Goal error (%)	Define the acceptable deviation from the design match
	Timeout (s)	Set max number of seconds before timeout
	Max number of solutions	Set max number of solutions to be displayed
Manufacturing Constraints	Max # Modules	Set max number of heat exchangers in the system
	Max # Flow Divisions	Set max number of flows (Side B: Gas/Steam)
	Max # Steps (NS)	Set max number of steps (Side A: Liquid/Water)
	Max # Modules side A	Set max number of parallel (Side A: Liquid/Water)
	Max # Modules side B	Set max number of Parallel (Side B: Gas/Steam)
	For detailed information regarding modules *(See chapter 7.03 Module assembly)*	
Paths		
	Quotations folder	Set your path to your quotation folder
	Media database	Set your path to your media database if not using default. *Ex.: "C:\Users\petkoc\AppData\Roaming\AirecCalc 1.2\MediaDB.arm"*

15. Good to know!

Pressure (if not given)

	Value	unit	Description
Side A: Water	500	mbar	Max allowed pressure drop on side A Liquid/Water, if not given
	6	bar	Water for cooling has pressure 6 bar, if not given
Side B: Exhaust gas	2,5	mbar	Max allowed pressure drop on side B, exhaust gases from an open flame is, if not given
	10-15	mbar	Max allowed pressure drop on side B exhaust gases from an engine, if not given
	1	bar	Pressures for side B exhaust gases from engines entering the atmosphere, if not given
	1	bar	Pressures for side B exhaust gases from open flames entering the atmosphere, if not given
	NOTE	→	If there is more than 0,5 bar over pressure on the gas side PED (Pressure Equipment Directive) certifications applies

Speed (maximum)

Value	m/s	Description
3	m/s	Side A Liquid/Water (Side A) in pipes should have maximum speed of 3 m/s
15-20	m/s	Side B Gas/Steam in pipes should have maximum speed of 15-20 m/s

Brazing Material

Industry	Description
Food industry	Only use Nickel braced heat exchangers. Not Copper braced
For heavy oil, on liquid side	Only use Nickel braced exchangers. Attention! Not copper braced due to sulfur in oil. Will dissolve the copper

Stainless Steel and Corrosion

IMPORTANT!

AIREC Heat Exchangers are not suitable if you have:

Chlorides and high concentration or acids and other applications corrosive for Stainless steel 316L

Mass flow

Description
CP* x kg/s x (Temp1-Temp2) = **kW**

*CP =	Gas/Liquid
1	Air
1,159	Exhaust
4,2	Water

Water boiling temperature (check with max surface temperature)

Pressure	Boiling temp.	Pressure	Boiling temp.	Pressure (bar)	Boiling temp.	Pressure	Boiling temp.

(bar)	(°C)	(bar)	(°C)		(°C)	(bar)	(°C)
1,0	100 °C	4,0	144 °C	5,5	156 °C	10,0	181 °C
3,0	134 °C	4,5	147 °C	6,0	158 °C	-	-
3,5	139 °C	5,0	152 °C	8,0	170 °C	-	-

ATTENTION!

So far have we learned that thermal fatigue has less to do with the gas side and its parameters but more to do with the cooling on the liquid side A. Sufficient cooling is critical not only for the performance but even more for the lifetime and functionality of the heat exchanger. If the water flow is reduced will it not only risk more boiling of the water but also much higher risk for thermal fatigue. When boiling occurs will the plate temperature locally be close to the gas temperature. That will not only reduce the heat transfer effect but also cause thermal fatigue. Such thermal fatigue can cause cracks and leakage.

Cleaning

Description
Diesel exhaust, carbon particles, will eventually clog the heat exchanger. Regular cleaning is necessary

Housing Inlet Flow (V)